Amendments to the Specification

The paragraph starting at page 2, line 6 and ending at line 21 has been amended as follows.

When ejection does not take place for a predetermined time or more, the viscosity of ink increases due to evaporation of moisture in the vicinity of ejection holes, and the discharge condition may be consequently degraded especially for several initial shots of ejection. Hereinafter, such a discharge condition of several initial shots is referred to as "initial discharge condition". A solution to this problem is to perform ejection a predetermined number of times until normal ejection is enabled in a place other than a recording position during recording or before the next recording is started. Such an ejecting operation is generally referred to as "preliminary ejection". However, a problem still arises in that ~~recoding~~ recording speed is reduced by preliminary ejection because it interrupts recording when performed during recording.

The paragraph starting at page 4, line 4 and ending at line 15 has been amended as follows.

When the sub-heaters are used as a heating source for the ink, in general, the sub-heaters are continuously energized until the predetermined temperature is reached. Referring to the detection of the recording head temperature, the temperature of the ink

may be detected either directly or indirectly. In either case, the energization of the sub-heaters is continued until the temperature of the recording heads thus detected reaches the predetermined temperature and stopped when it becomes equal to or higher than the predetermined temperature. The temperature of the ~~recoding~~ recording heads is kept within the predetermined range through repetition of the process.

The paragraph starting at page 5, line 17 and ending at line 22 has been amended as follows.

When heaters of low power ~~is~~ are used, a target temperature can be maintained with reduced temperature ripples by turning the energization of the same on and off repeatedly. However, it takes a long time to reach the target temperature when a great temperature increase is needed, which can affect recording time.

The paragraph starting at page 5, line 23 and ending at page 6, line 15 has been amended as follows.

A possible approach is to perform temperature adjustment before a recording start instruction is received and to perform ejection as soon as the recording start instruction is received in order to prevent any adverse effect on the time of recording since the point in time when the recording start instruction is received. However, there will be no change in the time spent before the temperature of the recording heads reaches the target

temperature in practice. When there is a great difference between the target temperature and the ambient temperature, the viscosity of the ink in the recording heads increases as a result of an increase in the density of a dye in the ink because a great amount of moisture evaporates from the recording heads when they stand by, which can result in degradation of the initial discharge condition. Further, since the recording heads are kept at a relatively high temperature, the generation and growth of bubbles in the ink ~~is~~ are promoted, and the ejection performance of the recording heads is therefore more vulnerable to adverse effects.

The paragraph starting at page 7, line 12 and ending at line 25 has been amended as follows.

In a first aspect of the present invention, there is provided an inkjet recording apparatus for performing recording by ejecting ink ~~on to~~ onto a recording medium using a plurality of recording heads which apply heat to the ink with heating means to generate bubbles in the ink and to eject the ink with the pressure of the bubbles, the apparatus comprising: recording mode setting means for setting a head that is to be used for recording and a head that is not to be used among the plurality of recording heads; and control means for heating the recording head that is set to be not used for recording by the recording mode setting means to adjust the temperature of the recording head to be used for recording utilizing heat conduction.

The paragraph starting at page 7, line 26 and ending at page 8, line 13 has been amended as follows.

In a second aspect of the present invention there is provided an inkjet recording apparatus for performing recording by ejecting ink ~~on to~~ onto a recording medium using a plurality of recording heads which apply heat to the ink with heating means to generate bubbles in the ink and to eject the ink with the pressure of the bubbles, the apparatus comprising: discrimination means for discriminating between a recording head that is to be used and a recording head that is not to be used for the next recording to be performed; and control means for heating the recording head discriminated to be not used by the discrimination means before the recording head discriminated to be used for recording starts a recording operation to adjust the temperature of the recording head utilizing heat conduction.

The paragraph starting at page 8, line 14 and ending at line 18 has been amended as follows.

The above and other objects, effects, features and advantages of the present invention will become more apparent from the following description of ~~embodiment~~ embodiments thereof taken in conjunction with the accompanying drawings.

The paragraph starting at page 10, line 22 and ending at page 11, line 4 has been amended as follows.

Fig. 2 shows an example of a configuration of the head cartridge H. The head cartridge H has a head unit 400 that is configured integrally with a plurality of recording heads, and ink tanks 410 in which ink is ~~reserved~~ stored to supply ink to each of the recording heads of the head unit 400. For example, ink tanks 410 for six colors, i.e., ~~black,~~ black (Bk), cyan (C), magenta (M), yellow (Y), light cyan (LC), and light magenta ~~(LM)~~ (LM), are prepared independently of each other, and each of them can be attached to and detached from the head unit 400.

The paragraph starting at page 11, line 11 and ending at line 22 has been amended as follows.

The recording element substrate 420 is a silicon substrate, and a plurality of recording elements (which are also called nozzles) for ejecting ink and a plurality of ink channels associated with the recording ~~elements respectively~~ elements, respectively, are formed on one side of the substrate, the elements and channels being integrally formed using a photolithographic technique. The recording element substrates 420 are provided to serve six colors, and securely bonded to the first plate 430 adjacently each other. In this specification, such a configuration is regarded as an integral configuration of a plurality of recording heads.

The paragraph starting at page 12, line 13 and ending at page 13, line 13 has been amended as follows.

Fig. 4 is a partially cutaway perspective view of one of the recording heads of the recording element substrate 420 shown in Fig. ~~3~~ 3, showing a structure in the vicinity of ejection holes thereof. In Fig. 4, reference numeral 421 represents ejection heaters for heating ink to eject the same. A sub-heater (not shown) for the recording head is also provided on the same substrate. Reference numeral 422 represents ink ejection holes; reference numeral 423 represents the element substrate; reference numeral 424 represents an ink supply hole for supplying ink from the ink tank 410; reference numeral 425 represents an ejection hole plate inward of which the ink ejection holes 422 are formed; reference numeral 426 represents channel walls that define ink channels connected to the ink ejection holes ~~422~~ 422, respectively; ~~and~~ reference numeral 427 represents a resin coating layer; and reference numeral 428 represents a temperature sensor. The temperature sensor 428 is for detecting the temperature of the neighborhood of the ejection holes of the recording head. The temperature sensor 428 may be provided in each of the six recording heads, and it may alternatively be provided on the element substrate of only one of the recording heads. Since the first plate 430 is formed with the ink supply holes 431 to serve six colors as described with reference to Fig. 3, the temperature of the recording element substrate 420 as a whole can be substantially reliably detected even if there is only one temperature sensor.

The paragraph starting at page 15, line 6 and ending at line 12 has been amended as follows.

Fig. 6 is a plan view of the head unit shown in Fig. 2 taken on the side thereof where the ejection holes are located. As apparent from the figure, the recording heads of the respective colors, i.e., black, light cyan, light magenta, cyan, magenta, and ~~yellow~~ yellow, are arranged on the same plate in the above order of the colors starting with the black recording head at the left end.

The paragraph starting at page 18, line 6 and ending at line 19 has been amended as follows.

According to the above-described method, since the temperature of the recording heads is adjusted only through short pulse heating, a target temperature can be reached in a short time. Further, the control circuit is simplified. Further, recording is not interrupted because temperature adjustment can be carried out using only the recording heads that are not used for recording, which improves the speed of recording. For example, when an ink is used which can maintain the favorable discharge condition without ejecting ~~for~~ takes about 10 seconds at a temperature of 25°C and about 40 seconds at 40°C, the number of recovery operations such as preliminary ejection is reduced according to the present embodiment to allow the speed of recording to be improved.

The paragraph starting at page 19, line 4 and ending at line 12 has been amended as follows.

Fig. 8 is a flow chart for explaining processes performed by a controller 500 in the present embodiment. The controller 500 in the present embodiment also starts adjusting the temperature of the recording heads when a recording start instruction is input and causes ink ejection to start a recording operation when a predetermined target temperature is reached. A first target temperature is 35°C and a second target temperature ~~of~~ is 40°C.

The paragraph starting at page 21, line 1 and ending at line 12 has been amended as follows.

The method utilizing short pulse heating as described in the first embodiment can result in the generation of bubbles in ink because it involves an abrupt increase in the head temperature, although the method allows the temperature of the recording heads to reach a target in a short time. The concern in the first embodiment can be eliminated to allow more stable temperature adjustment by the method according to the present embodiment in which the sub-heaters are used to heat all the ~~recoding~~ recording heads until immediately before the beginning of recording and to heat the recording heads LC and LM during recording.

The paragraph starting at page 21, line 20 and ending at page 22, line 9 has been amended as follows.

A third embodiment of the invention will now be described. In the present embodiment, the combination of used recording heads and unused recording heads depends on recording modes just as in the above-described embodiments. Further, sub-heaters are used or not used depending on the recording modes just as in the second embodiment. A description will now be made on a recording mode in which recording is performed using the recording heads of four colors, i.e., Bk, C, M, and ~~Y~~ Y, in the recording head shown in Fig. 6. In the present embodiment, control for temperature adjustment is performed at a predetermined time interval between the end of each recording operation and the beginning of the next recording operation when recording is successively performed on a plurality of sheets, and temperature control is performed for the recording heads LC and LM that are not used for recording.

The paragraph starting at page 23, line 13 and ending at line 27 has been amended as follows.

It should not be construed that the invention is advantageous only for recording utilizing recording heads for four colors of a head unit comprising recording heads for six colors. The invention may be applied to any case wherein a head unit integrally configured of a plurality of recording heads is used and wherein recording is

performed using some of the recording heads. For example, the invention may be used in a monochromatic recording mode in which a head unit comprising heads for four colors, i.e., Bk, C, M, and ~~Y~~ Y, is used and in which recording is performed using only the Bk head. At this time, temperature control is preferably performed using recording heads adjacent to the Bk head in order to improve the efficiency of heat conduction. Obviously, all of the remaining recording heads for C, M, and Y may be used.

The paragraph starting at page 24, line 21 and ending at page 25, line 1 has been amended as follows.

The present invention has been described in detail with respect to preferred embodiments, and it will now be apparent from the foregoing to those skilled in the art that changes and modifications may be made without departing from the invention in its broader ~~aspect,~~ aspects, and it is the intention, therefore, ~~in~~ that the ~~apparent~~ appended claims ~~to~~ cover all such changes and modifications as fall within the true spirit of the invention.